



# **Aeronautics Research Mission Directorate Integrated Systems Research Program (ISRP) and UAS Integration in the NAS Project**

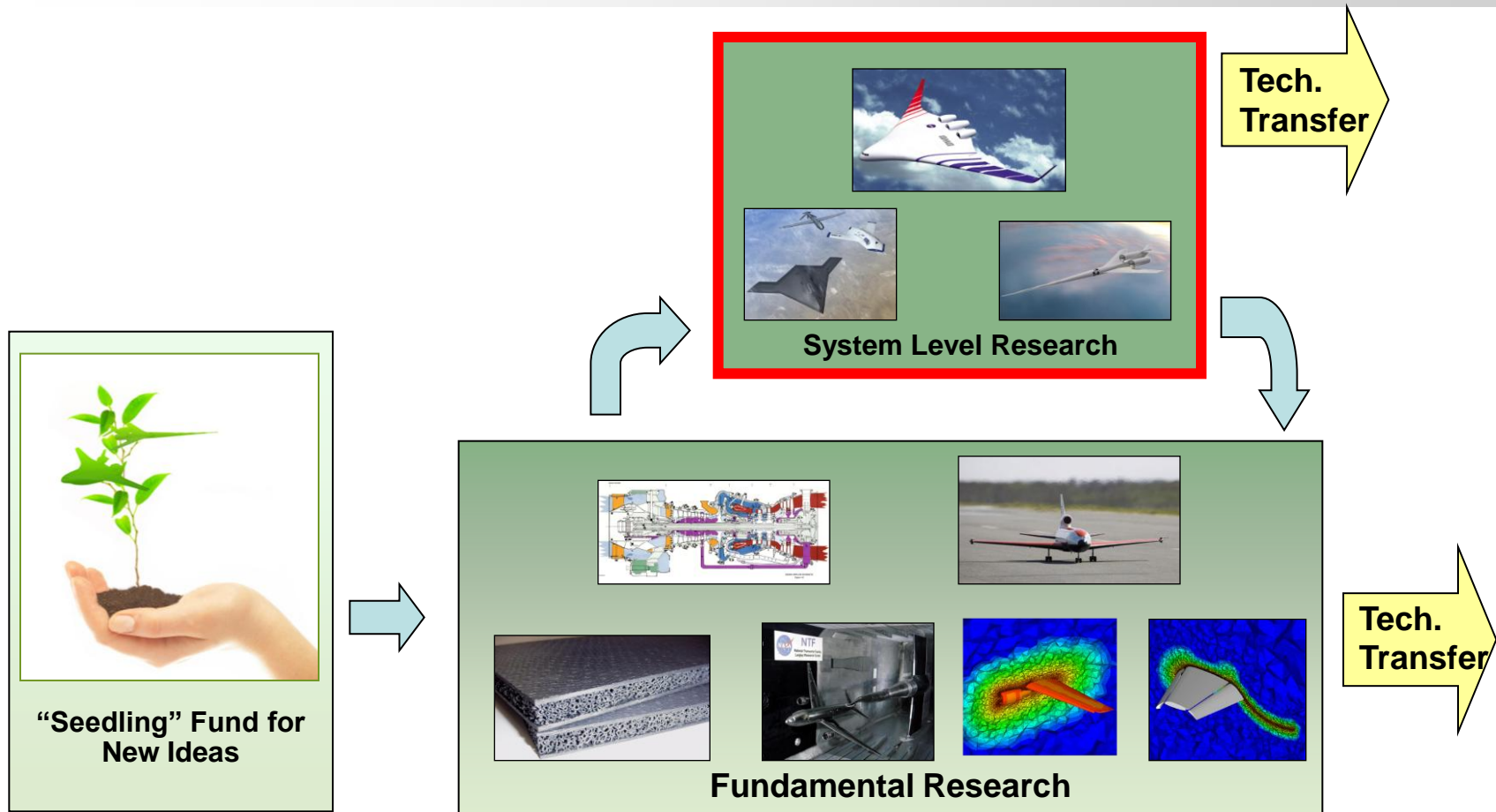


**Presented by: Ms. Jean Wolfe  
Director (Acting), Integrated Systems Research Program**

**Meeting of Experts on NASA's Unmanned Aircraft System (UAS) Integration in the  
National Airspace Systems (NAS) Project**

**Aeronautics and Space Engineering Board  
National Research Council  
August 5, 2010**

# NASA Aeronautics Investment Strategy



Enabling “Game Changing” concepts and technologies from advancing fundamental research ultimately to understand the feasibility of advanced systems

# NASA Aeronautics Portfolio in FY2010

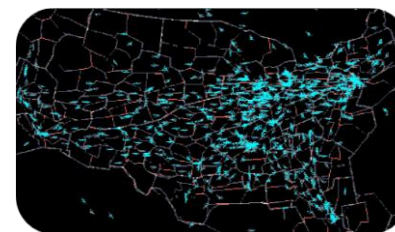


## Fundamental Aeronautics Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to enable revolutionary changes for vehicles that fly in all speed regimes.

## Integrated Systems Research Program

Conduct research at an integrated system-level on promising concepts and technologies and explore/assess/demonstrate the benefits in a relevant environment



## Airspace Systems Program

Directly address the fundamental ATM research needs for NextGen by developing revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the NAS.



## Aviation Safety Program

Conduct cutting-edge research that will produce innovative concepts, tools, and technologies to improve the intrinsic safety attributes of current and future aircraft.



## Aeronautics Test Program

Preserve and promote the testing capabilities of one of the United States' largest, most versatile and comprehensive set of flight and ground-based research facilities.

# ISRP Goal and Characteristics



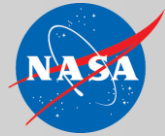
## **Integrated Systems Research Program (ISRP):**

Research and technology (R&T) program that will conduct research at an integrated system-level on promising concepts and technologies and explore, assess, or demonstrate the benefits in a relevant environment

## **Criteria for selection of projects for Integrated Systems Research:**

- Technology has attained enough maturity in the foundational research program that they merit more in-depth evaluation at an integrated system level in a relevant environment
- Technologies which systems analysis indicates have the most potential for contributing to the simultaneous attainment of goals
- Technologies identified through stakeholder input as having potential for simultaneous attainment of goals
- Research not being done by other government agencies and appropriate for NASA to conduct
- Budget augmentation

# Integrated Systems Research Program Overview



## **Program Goal:**

Conduct research at an integrated system-level on promising concepts and technologies and explore, assess, or demonstrate the benefits in a relevant environment

### ***Environmentally Responsible Aviation (ERA) Project***

Explore and assess new vehicle concepts and enabling technologies through system-level experimentation to *simultaneously* reduce fuel burn, noise, and emissions

### ***Unmanned Aircraft Systems (UAS) Integration in the National Airspace System (NAS) Project***

Contribute capabilities that reduce technical barriers related to the safety and operational challenges associated with enabling routine UAS access to the NAS

### ***Innovative Concepts for Green Aviation (ICGA) Project***

Spur innovation by offering research opportunities to the broader aeronautics community through peer-reviewed proposals, with a focus on making aviation more eco-friendly. Establish incentive prizes similar to the Centennial Challenges and sponsor innovation demonstrations of selected technologies that show promise of reducing aviation's impact on the environment



# FY 2011 Budget Submit



|  | (\$ Millions) | FY 2009<br>Actual 1/ | FY 2010<br>Enacted  | FY 2011             | FY 2012             | FY 2013             | FY 2014             | FY 2015             |
|--|---------------|----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>Aeronautics Total</b>               |               | <b><u>650.0</u></b>  | <b><u>507.0</u></b> | <b><u>579.6</u></b> | <b><u>584.7</u></b> | <b><u>590.4</u></b> | <b><u>595.1</u></b> | <b><u>600.3</u></b> |
| <b>Aviation Safety</b>                 |               | <b>89.3</b>          | <b>75.0</b>         | <b>79.3</b>         | <b>78.9</b>         | <b>81.2</b>         | <b>81.9</b>         | <b>82.7</b>         |
| <b>Airspace Systems</b>                |               | <b>121.5</b>         | <b>80.0</b>         | <b>82.2</b>         | <b>82.9</b>         | <b>85.9</b>         | <b>86.6</b>         | <b>87.4</b>         |
| <b>Fundamental Aeronautics</b>         |               | <b>307.6</b>         | <b>220.0</b>        | <b>228.5</b>        | <b>231.4</b>        | <b>236.0</b>        | <b>241.8</b>        | <b>244.6</b>        |
| <b>Aeronautics Test</b>                |               | <b>131.6</b>         | <b>72.0</b>         | <b>76.4</b>         | <b>76.4</b>         | <b>75.6</b>         | <b>77.4</b>         | <b>78.2</b>         |
| <b>Integrated Systems Research</b>     |               | <b><u>0.0</u></b>    | <b><u>60.0</u></b>  | <b><u>113.1</u></b> | <b><u>115.1</u></b> | <b><u>111.7</u></b> | <b><u>107.4</u></b> | <b><u>107.4</u></b> |
| Environmentally Responsible Aviation   |               | 0.0                  | 60.0                | 73.1                | 75.1                | 71.7                | 67.4                | 67.4                |
| Innovative Concepts for Green Aviation |               | 0.0                  | 0.0                 | 10.0                | 10.0                | 10.0                | 10.0                | 10.0                |
| UAS Integration into the NAS           |               | 0.0                  | 0.0                 | 30.0                | 30.0                | 30.0                | 30.0                | 30.0                |

1/ FY 2009 shows the July Operating Plan including the American Recovery and Reinvestment Act.

2/ FY 2010 shows the Consolidated Appropriation Act, 2010 (PL 111-117) without the Administrative transfers.

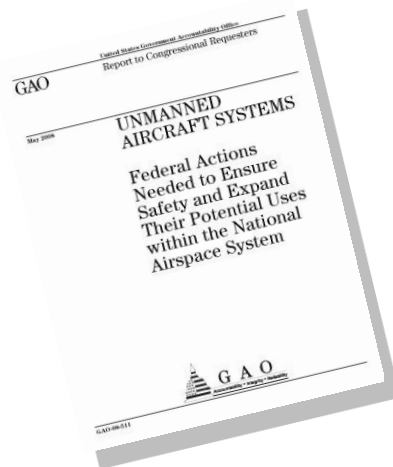
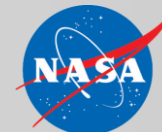
# Rationale for UAS Integration in the NAS Project



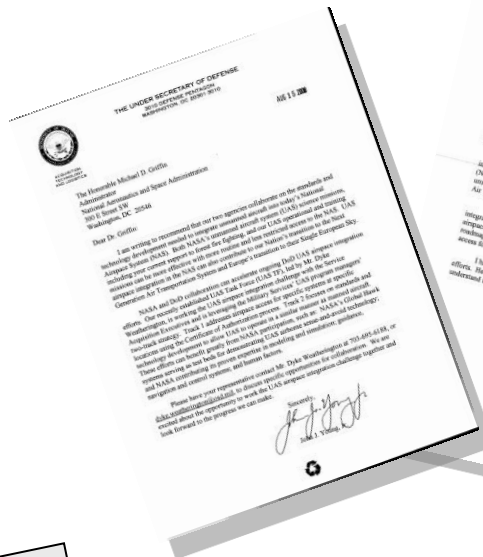
- The need to fly UAS in the NAS is of increasing urgency to perform missions of vital importance to national security and defense, emergency management, and science (DOD, DHS, FEMA, NASA, DOC, NOAA)
- UAS are unable to routinely access the airspace system today
- No regulations for UAS exist – aviation regulations built upon condition of pilot being onboard vehicles
- Need technologies and procedures to enable seamless operation and integration of UAS in the NAS



# Alignment



GAO Report



NRC Report

- D10 Safe operation of unmanned aerial vehicles in the national airspace  
The use of UAVs for a variety of civil applications (e.g., farming, border communications relays, pipeline monitoring, power line and pipeline monitoring, and firefighting) will continue to increase. Flight operations of military UAVs in civil airspace is also expected to increase. To facilitate these operations, UAVs should be integrated into the air transportation system...

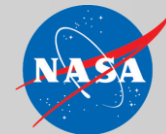
## Under Secretary of Defense for Acquisition, Technology, and Logistics and NASA Administrator Correspondence

**SEC. 1116. COOPERATIVE UNMANNED AERIAL VEHICLE ACTIVITIES.**  
The Administrator, in cooperation with the Administrator of NOAA and in coordination with other agencies that have existing civil capabilities, shall continue to utilize the capabilities of unmanned aerial vehicles as appropriate in support of NASA and interagency cooperative missions. The Administrator may enter into cooperative agreements with universities with unmanned aerial vehicle programs and related assets to conduct collaborative research and development activities, including development of appropriate applications of small unmanned aerial vehicle technologies and systems in remote areas.

Decadal Survey



# Executive Branch Guidance



- Address operational and safety issues related to the integration of unmanned aircraft systems (UAS) into the national airspace
- Coordinate efforts with other UAS stakeholders in the DoD, DHS and FAA to avoid duplication and accommodate all user requirements

# NASA Contributions to UAS Integration in the NAS



- Concept of Operations (ConOps) and Technology Roadmaps to enable focus for research and technology investments
- Simulations and field trials of technology developments designed to achieve safe separation of UAS in NextGen traffic densities
- Validated design guidelines and prototypes to improve safety and reliability
- Agreements with partners and stakeholders to effectively transition matured technology and inform investment readiness and implementation decisions for measurable system benefits

